

Attachment 2 - Emission Results

Type	Locomotive
Amount Reduced per Year (Fuel, gallons)	100,000.00
Amount Reduced per Year(CO, short tons)	1.6315
Amount Reduced per Year(CO2, short tons)	1,125.00
Amount Reduced per Year(HC, short tons)	0.5991
Amount Reduced per Year(NOx, short tons)	8.5399
Amount Reduced per Year(PM2.5, short tons)	0.3187
Annual Baseline of Vehicles (CO, short tons)	1.631509631
Annual Baseline of Vehicles (CO2, short tons)	1125
Annual Baseline of Vehicles (Fuel, gallons/year)	100000
Annual Baseline of Vehicles (HC, short tons)	0.599069942
Annual Baseline of Vehicles (NOx, short tons)	8.539933222
Annual Baseline of Vehicles (PM2.5, short tons)	0.318654225
Annual Usage Hours	1000
Baseline of Vehicles Retrofitted per year (CO, short tons/year)	1.6315
Baseline of Vehicles Retrofitted per year (CO2, short tons/year)	1,125.00
Baseline of Vehicles Retrofitted per year (Fuel, gallons/year)	100,000.00
Baseline of Vehicles Retrofitted per year (HC, short tons/year)	0.5991
Baseline of Vehicles Retrofitted per year (NOx, short tons/year)	8.5399
Baseline of Vehicles Retrofitted per year (PM2.5, short tons/year)	0.3187
Calculated Fuel Volume	100000
Capital Cost Effectiveness (\$/short ton), Retrofitted Vehicles (CO)	486,298.08
Capital Cost Effectiveness (\$/short ton), Retrofitted Vehicles (CO2)	705.24
Capital Cost Effectiveness (\$/short ton), Retrofitted Vehicles (HC)	1,324,386.26
Capital Cost Effectiveness (\$/short ton), Retrofitted Vehicles (NOx)	92,904.71
Capital Cost Effectiveness (\$/short ton), Retrofitted Vehicles (PM2.5)	2,489,846.17
Class	1
Diesel Fuel Reduced (gallons)	100000
Displacement (liters per cylinder)	11.6 L
Fuel Type	ULSD (diesel)
Fuel Volume	100000
Horsepower	4300
Hoteling Hours/Year	

Idling Hours/Year	
Installation Cost	\$1,280,967
Lifetime Amount After Retrofit, Retrofitted Vehicles (Fuel, gallons)	0
Lifetime Amount Emitted After Retrofit, Retrofitted Vehicles (CO, short tons)	0
Lifetime Amount Emitted After Retrofit, Retrofitted Vehicles (CO2, short tons)	0
Lifetime Amount Emitted After Retrofit, Retrofitted Vehicles (HC, short tons)	0
Lifetime Amount Emitted After Retrofit, Retrofitted Vehicles (NOx, short tons)	0
Lifetime Amount Emitted After Retrofit, Retrofitted Vehicles (PM2.5, short tons)	0
Lifetime Amount Reduced (CO, short tons)	8.1575
Lifetime Amount Reduced (CO2, short tons)	5,625.00
Lifetime Amount Reduced (Fuel, gallons)	500,000.00
Lifetime Amount Reduced (HC, short tons)	2.9953
Lifetime Amount Reduced (NOx, short tons)	42.6997
Lifetime Amount Reduced (PM2.5, short tons)	1.5933
Lifetime Baseline of Vehicles (CO, short tons)	8.157548153
Lifetime Baseline of Vehicles (CO2, short tons)	5625
Lifetime Baseline of Vehicles (Fuel, gallons/year)	500000
Lifetime Baseline of Vehicles (HC, short tons)	2.995349712
Lifetime Baseline of Vehicles (NOx, short tons)	42.69966611
Lifetime Baseline of Vehicles (PM2.5, short tons)	1.593271124
Lifetime Baseline of Vehicles Retrofitted (CO, short tons)	8.1575
Lifetime Baseline of Vehicles Retrofitted (CO2, short tons)	5,625.00
Lifetime Baseline of Vehicles Retrofitted (Fuel, gallons/year)	500,000.00
Lifetime Baseline of Vehicles Retrofitted (HC, short tons)	2.9953
Lifetime Baseline of Vehicles Retrofitted (NOx, short tons)	42.6997
Lifetime Baseline of Vehicles Retrofitted (PM2.5, short tons)	1.5933

Model Year	2000
New Displacement (liters per cylinder)	
New Horsepower	4300
New Model Year	2024
New Tier	0-emission
Number of Vehicles/Engines	1
Percent Reduced (CO, %)	100.00%
Percent Reduced (CO2, %)	100.00%
Percent Reduced (Fuel, %)	100.00%
Percent Reduced (HC, %)	100.00%
Percent Reduced (NOx, %)	100.00%
Percent Reduced (PM2.5, %)	100.00%
Reduced Hoteling (hours)	
Reduced Idling (hours)	
Remaining Life	5
Retrofit Year	2022
Sector	Freight
Target Fleet	Line Haul Locomotive
Technology Description	Engine Replacement - All-Electric
Tier	Tier 1
Unit Cost	\$2,686,033
Vehicle Miles Traveled/Year (VMT)	
Vocation	Freight

Mei Wang	6/12/2021	Detailed Report from the Diesel Emissions Quantifier			
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Type	Sector	Target Fleet	Class	Vocation	
Locomotive	Freight	Line Haul Locomotive	I	Freight	



Number of Vehicles/Engines	Tier	Model Year	Retrofit Year	Horsepower
1	Tier 1	2000	2022	4300



Displacement (liters per cylinder)	Fuel Type	Fuel Volume	Calculated Fuel Volume
11.6	ULSD (diesel)	100000	100000



Vehicle Miles Traveled/Year (VMT)	Annual Usage Hours	Idling Hours/Year	Hoteling Hours/Year
	1000		



Remaining Life	Technology Description	New Tier	New Model Year	New Horsepower
5	Engine Replacement - All-Electric		2024	4300



New Displacement (liters per cylinder)	Diesel Fuel Reduced (gallons)	Reduced Idling (hours)
	100000	



Reduced Hoteling (hours)	Installation Cost	Unit Cost	Annual Baseline of Vehicles (NOx, short tons)
	\$1,280,967	\$2,686,033	8.539933222

	5 -years	42.69966611
	10-year	85.39933222

Lifetime Baseline of Vehicles (NOx, short tons)	Percent Reduced (NOx, %)
42.69966611	100.00%

213.4983306
426.9966611

Baseline of Vehicles Retrofitted per year (NOx, short tons/year)	Amount Reduced per Year(NOx, short tons)
8.5399	8.5399

42.6995	42.6995
85.399	85.399

Lifetime Baseline of Vehicles Retrofitted (NOx, short tons)	Lifetime Amount Reduced (NOx, short tons)
42.6997	42.6997



Lifetime Amount Emitted After Retrofit, Retrofitted Vehicles (NO _x , short tons)	Capital Cost Effectiveness (\$/short ton), Retrofitted Vehicles (NO _x)
0	92,904.71



Annual Baseline of Vehicles (PM2.5, short tons)	Lifetime Baseline of Vehicles (PM2.5, short tons)
0.318654225	1.593271124



Percent Reduced (PM2.5, %)	Baseline of Vehicles Retrofitted per year (PM2.5, short tons/year)
100.00%	0.3187

1.5935
3.187

Amount Reduced per Year(PM2.5, short tons)	Lifetime Baseline of Vehicles Retrofitted (PM2.5, short tons)
0.3187	1.5933

1.5935
3.187

Lifetime Amount Reduced (PM2.5, short tons)	Lifetime Amount Emitted After Retrofit, Retrofitted Vehicles (PM2.5, short tons)
1.5933	0



Capital Cost Effectiveness (\$/short ton), Retrofitted Vehicles (PM2.5)	Annual Baseline of Vehicles (HC, short tons)
2,489,846.17	0.599069942



Lifetime Baseline of Vehicles (HC, short tons)	Percent Reduced (HC, %)
2.995349712	100.00%



Baseline of Vehicles Retrofitted per year (HC, short tons/year)	Amount Reduced per Year(HC, short tons)
0.5991	0.5991

2.9955
5.991

Lifetime Baseline of Vehicles Retrofitted (HC, short tons)	Lifetime Amount Reduced (HC, short tons)
2.9953	2.9953



Lifetime Amount Emitted After Retrofit, Retrofitted Vehicles (HC, short tons)	Capital Cost Effectiveness (\$/short ton), Retrofitted Vehicles (HC)
0	1,324,386.26



Annual Baseline of Vehicles (CO, short tons)	Lifetime Baseline of Vehicles (CO, short tons)
1.631509631	8.157548153



Percent Reduced (CO, %)	Baseline of Vehicles Retrofitted per year (CO, short tons/year)
100.00%	1.6315



Amount Reduced per Year(CO, short tons)	Lifetime Baseline of Vehicles Retrofitted (CO, short tons)
1.6315	8.1575



Lifetime Amount Reduced (CO, short tons)	Lifetime Amount Emitted After Retrofit, Retrofitted Vehicles (CO, short tons)
8.1575	0



Capital Cost Effectiveness (\$/short ton), Retrofitted Vehicles (CO)	Annual Baseline of Vehicles (CO2, short tons)
486,298.08	1125



Lifetime Baseline of Vehicles (CO2, short tons)	Percent Reduced (CO2, %)
5625	100.00%



Baseline of Vehicles Retrofitted per year (CO2, short tons/year)	Amount Reduced per Year(CO2, short tons)
1,125.00	1,125.00



Lifetime Baseline of Vehicles Retrofitted (CO2, short tons)	Lifetime Amount Reduced (CO2, short tons)
5,625.00	5,625.00



Lifetime Amount Emitted After Retrofit, Retrofitted Vehicles (CO2, short tons)	Capital Cost Effectiveness (\$/short ton), Retrofitted Vehicles (CO2)
0	705.24



Annual Baseline of Vehicles (Fuel, gallons/year)	Lifetime Baseline of Vehicles (Fuel, gallons/year)
100000	500000



Percent Reduced (Fuel, %)	Baseline of Vehicles Retrofitted per year (Fuel, gallons/year)
100.00%	100,000.00



Amount Reduced per Year (Fuel, gallons)	Lifetime Baseline of Vehicles Retrofitted (Fuel, gallons/year)
100,000.00	500,000.00



Lifetime Amount Reduced (Fuel, gallons)	Lifetime Amount After Retrofit, Retrofitted Vehicles (Fuel, gallons)
500,000.00	0

